RUGGEDCOM®
INDUSTRIAL STRENGTH NETWORKS™

RuggedSwitch™ RS900G

10-Port Managed Ethernet Switch with Gigabit Uplink Ports

Installation Guide

www.ruggedcom.com

RuggedCom Inc. I 300 Applewood Crescent, Concord, Ontario, Canada L4K 5C7
Tel: +1 905 856 5288 I **Fax**: +1 905 856 1995 I **Toll Free**: 1 888 264 0006

Copyright

COPYRIGHT © 2010 RuggedCom Inc. ALL RIGHTS RESERVED

Dissemination or reproduction of this document, or evaluation and communication of its contents, is not authorized except where expressly permitted. Violations are liable for damages. All rights reserved, particularly for the purposes of patent application or trademark registration.

This document contains proprietary information, which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced or translated to another language without the prior written consent of RuggedCom Inc.

Disclaimer of liability

We have checked the contents of this manual against the hardware and software described. However, deviations from the description cannot be completely ruled out.

RuggedCom shall not be liable for any errors or omissions contained herein or for consequential damages in connection with the furnishing, performance, or use of this material.

The information given in this document is reviewed regularly and any necessary corrections will be included in subsequent editions. We appreciate any suggested improvements. We reserve the right to make technical improvements without notice.

Registered Trademarks

RuggedSwitch® and ROS® are registered trademarks of RuggedCom Inc. RuggedRated, ROS and eRSTP are trademarks of RuggedCom Inc. Ethernet is a trademark of Xerox Corporation. Other designations in this manual might be trademarks whose use by third parties for their own purposes would infringe the rights of the owner.

Contacting RuggedCom

Corporate Headquarters	US Headquarters	Europe Headquarters
RuggedCom Inc. 300 Applewood Crescent Concord, Ontario Canada, L4K 5C7 Tel: +1 905 856 5288 Fax: +1 905 856 1995 Toll-free: 1 888 264 0006	RuggedCom 1930 Harrison St., Suite 209 Hollywood, Florida USA, 33020 Tel: +1 954 922 7938 ext. 103 Fax: +1 954 922 7984 Toll-free: 1 888 264 0006	RuggedCom Unit 41, Aztec Centre, Aztec West, Almondsbury, Bristol United Kingdom BS32 4TD Tel: +44 1454 203 404 Fax: +44 1454 203 403
Email: RuggedSales@RuggedCom.com		

Technical Support
Toll Free (North America): 1 866 922 7975 International: +1 905 856 5288 Email: Support@RuggedCom.com

Web: www.RuggedCom.com

© 2010 RuggedCom Inc. All rights reserved

Federal Communications Commission
Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.

Caution

This product contains a laser system and is classified as a "CLASS 1 LASER PRODUCT".

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void.

Should this device require service see the "Warranty" section of this installation guide.

Important

This unit should be installed in a restricted access location where access can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and access is through the use of a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.

© 2010 RuggedCom Inc. All rights reserved

Table of Contents

1 Product Overview 5
1.1 RS900G Family Front Panel Description 6
1.2 RS900G Family Bottom View 7
2 Installation 8
2.1 DIN Rail Mounting 8
2.2 Power Supply Wiring and Grounding 9
2.2.1 HI Power Supply Wiring and Grounding 9
2.2.2 DC Power Supply Wiring and Grounding 10
2.3 HIPOT (Dielectric Strength) Testing 11
2.4 Failsafe Output Wiring and Specifications 12
2.5 RS232 Port Wiring 13
2.6 RJ45 Ports – Signal Description 14
3 Technical Specifications 15
3.1 Operating Environment 15
3.2 Power Supply Specifications 15
3.3 Failsafe Relay Specifications 15
3.4 Twisted Pair Data Port Specifications 16
3.5 Fiber Optical Port Specifications 16
3.6 Physical Dimensions 17
4 Type Tests 18
4.1 IEC 61850-3 Type Tests 18
4.2 IEEE 1613 Type Tests 19
4.3 IEC Environmental Type Tests 19
4.4 Agency Approvals 20
5 Warranty 20

© 2010 RuggedCom Inc. All rights reserved

1 Product Overview

The RuggedSwitch™ RS900G is an industrially hardened, fully managed Ethernet switch providing dual fiber optical Gigabit Ethernet ports and eight Fast Ethernet copper ports. Designed to operate reliably in harsh industrial environments, the RS900G provides a high level of immunity to electromagnetic interference and heavy electrical surges typical of environments found in electric utility substations, factory floors or in curb side traffic control cabinets. An operating temperature range of -40°C to +85°C coupled with hazardous location certification, a galvanized steel enclosure and optional conformal coating allows the RS900G to be placed in almost any location.

The embedded Rugged Operating System (ROS™) provides advanced networking features such as Enhanced Rapid Spanning Tree (eRSTP™), Port Rate Limiting and a full array of intelligent functionality for high network availability and manageability.

Ethernet Ports

- 2 - Fiber Optic Gigabit-Ethernet Ports
- 8 - Fast Ethernet Ports (10/100BaseTX)
- Full compliance with IEEE: 802.3, 802.3u and 802.3z
- Non-blocking, store and forward switching
- Full duplex operation and flow control (IEEE 802.3x)
- Industry standard fiber optical connectors: LC, SC, SFP
- Bi-Directional simplex fiber support
- Long haul optics allow Gigabit distances up to 70km

RuggedRated™ for Reliability in Harsh Environments

- Meets IEEE 1613 (electric utility substations)
- Exceeds IEC 61850-3 (electric utility substations)
- Exceeds IEEE 61800-3 (variable speed drive systems)
- Exceeds IEC 61000-6-2 (generic industrial environment)
- Exceeds NEMA TS-2 (traffic control equipment)
- Hazardous Location Certification: Class 1 Division 2
- -40 to +85°C operating temperature (no fans)
- Conformal coated circuit boards (optional)
- 20 AWG galvanized steel enclosure

Universal Power Supply Options

- Fully integrated power supply
- Universal high-voltage range: 88-300VDC or 85-264VAC
- Dual low-voltage DC inputs (12, 24 or 48 VDC)
- CSA/UL 60950 safety approved to +85°C

Simple Plug and Play Operation

- Automatic learning of up to 8192 MAC addresses
- Auto-negotiation on all 10/100BaseTX ports
- Auto-MDI/MDIX (crossover) on all 10/100BaseTX ports
- LED indicators for link, activity and speed

ROS™ Advanced Network Management

- Enhanced Rapid Spanning Tree (eRSTP™)
- Quality of Service (802.1p) for real-time traffic
- Port rate limiting: 128kbps to 8Mbps
- VLAN (802.1q) with double tagging
- IGMP Snooping for multicast filtering
- Port configuration, status, statistics, mirroring, security
- Loss of link management on fiber ports
- Web-based, Telnet, CLI management interfaces
- SNMP v2 and RMON
- Rich set of diagnostics with logging and alarms

© 2010 RuggedCom Inc. All rights reserved

1.1 RS900G Family Front Panel Description

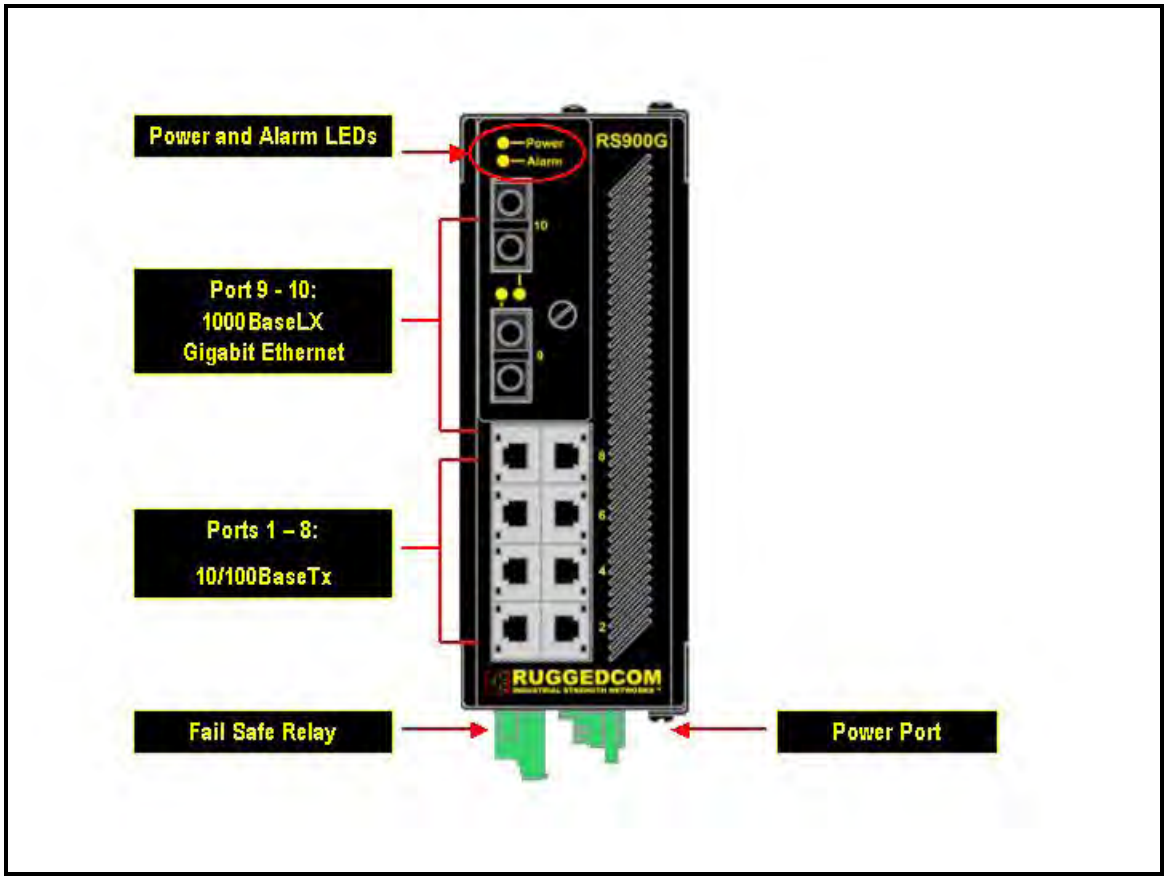


Figure 1.1.1 RS900G Front Panel View

ITEM	*Activity*	*Comments*
LINK LED (Yellow)	Solid	Link Established
	Blinking	Tx/Rx Activity
Power LED	Solid	Power On
Alarm LED	Solid	Alarm condition exists

© 2010 RuggedCom Inc. All rights reserved

1.2 RS900G Family Bottom View

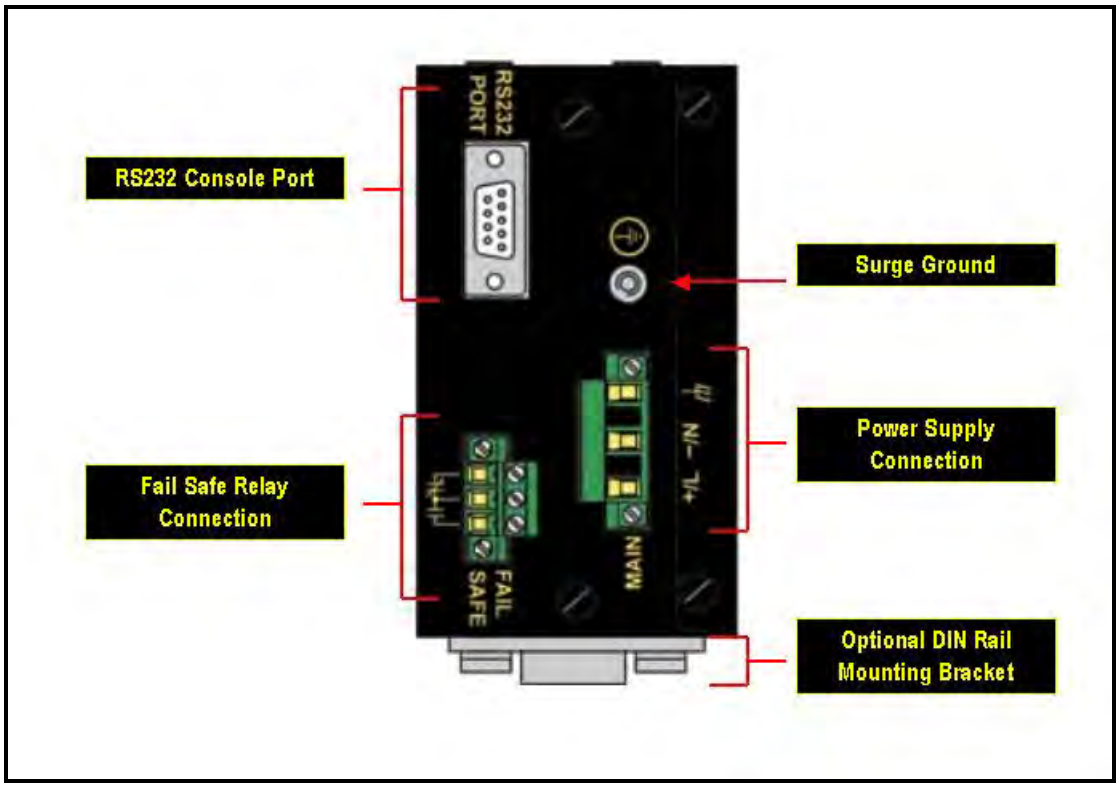


Figure 1.2.1 RS900G Family Bottom View

© 2010 RuggedCom Inc. All rights reserved

2 Installation

2.1 DIN Rail Mounting

An optional DIN rail mounting bracket is available for the RS900G. Figure 2.1.1 details mounting instructions for the standard 1" DIN Rail.

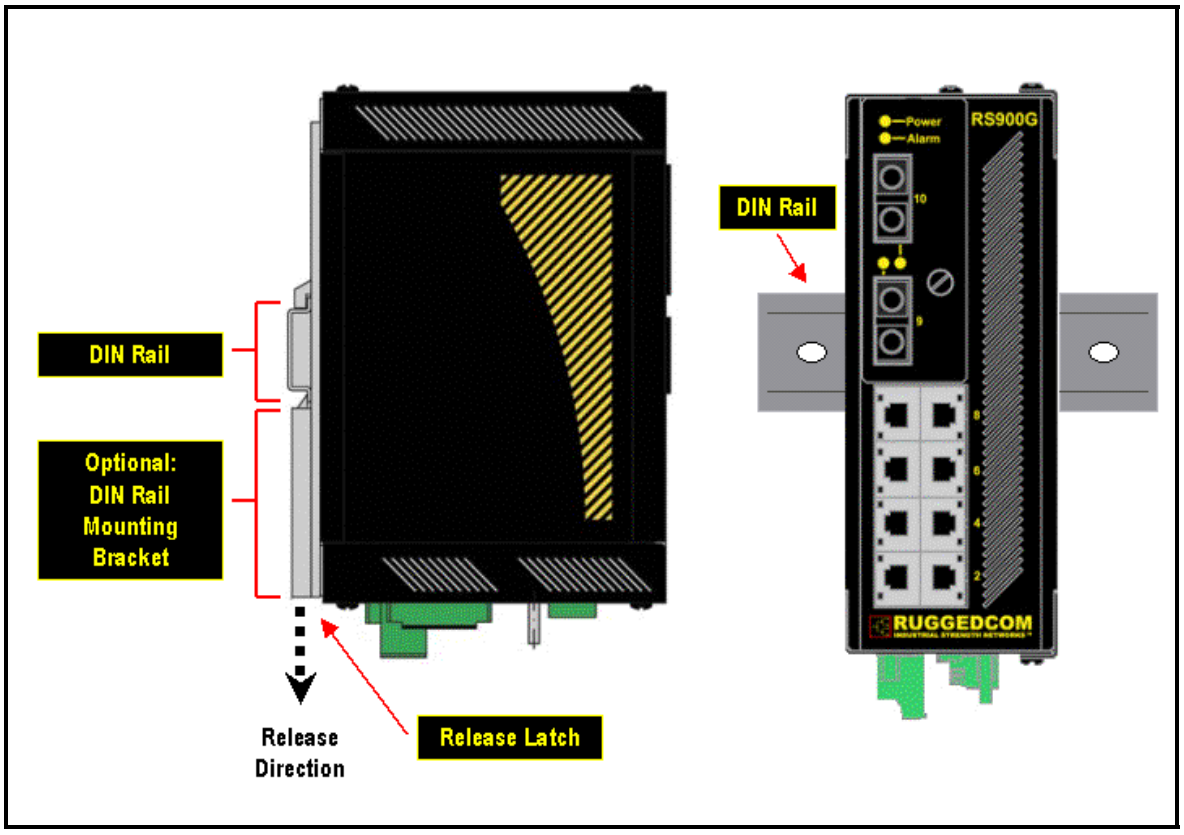


Figure 2.1.1 RS900G Family DIN Rail Mounting

© 2010 RuggedCom Inc. All rights reserved

2.2 Power Supply Wiring and Grounding

2.2.1 HI Power Supply Wiring and Grounding

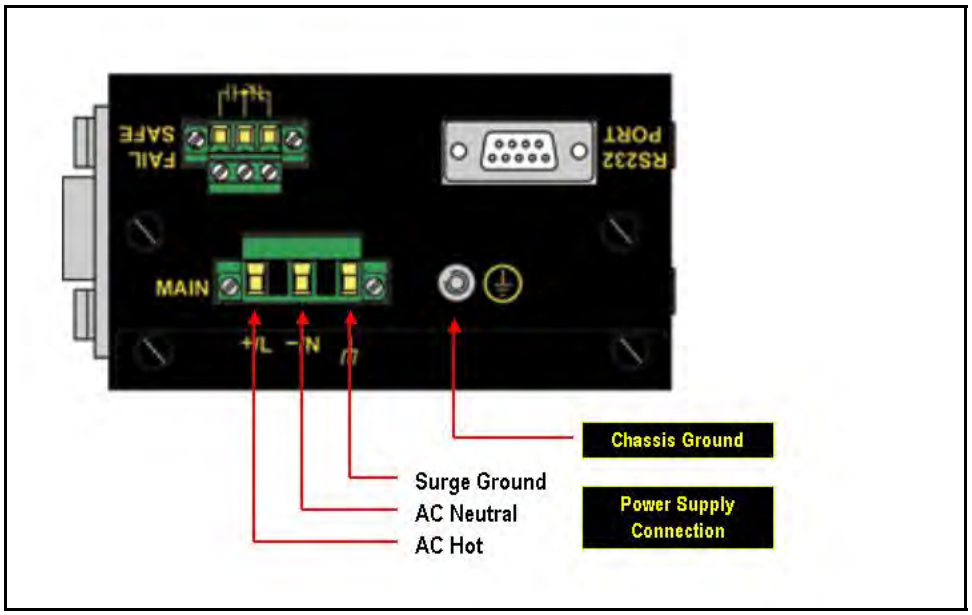


Figure 2.2.1 RS900G Family Power Supply Inputs

The RS900G family HI power supply inputs are identical and are connected as follows:

1. +/L should be connected to AC (Hot)
2. -/N should be connected to AC (Neutral)
3. Surge Ground is connected to the Chassis Ground via a braided cable or other appropriate grounding wire. Surge Ground is used as the ground conductor for all surge and transient suppression circuitry internal to the RS900G unit.
4. Chassis Ground should be connected to the AC Ground terminal

Notes:

1. Equipment must be installed according to the applicable country wiring codes.
2. Surge Ground MUST be disconnected from the Chassis Ground during HIPOT (dielectric strength) testing.
3. All line-to-ground transient energy is shunted to the Surge Ground terminal. In cases where users require the inputs to be isolated from ground, remove the ground braid between Surge and Chassis Ground. Note that all line-to-ground transient protection circuitry will be disabled.

© 2010 RuggedCom Inc. All rights reserved

2.2.2 DC Power Supply Wiring and Grounding

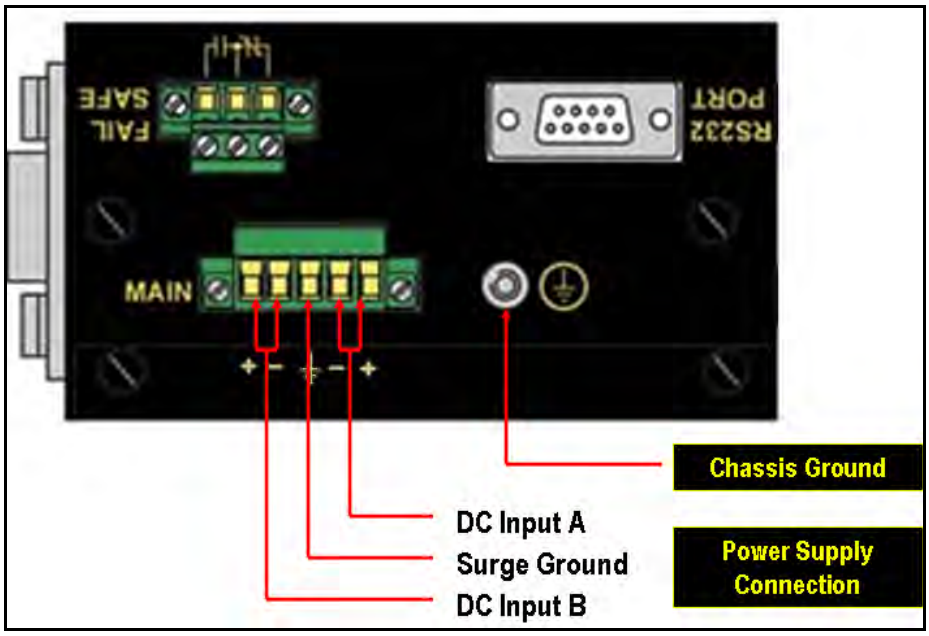


Figure 2.2.2.1 DC Power supply wiring and grounding diagram

The RS900 low voltage DC power supply features reverse polarity protection and dual independent inputs. This feature allows the connection of two DC sources with the same nominal voltage to provide redundant power supply inputs. The DC source must be connected to the DC inputs according to the polarity markings on the unit.

Notes:

1. Equipment must be installed according to the applicable country wiring codes.
2. Surge Ground should be connected to Chassis Ground via a braided cable or other appropriate ground wire.
3. Chassis Ground must be connected to the protective earth.
4. All line-to-ground transient energy is shunted to the Surge Ground terminal. In cases where users require the DC inputs to be isolated from ground, remove the ground braid between Surge and Chassis Ground. Note that all line-to-ground transient protection circuitry will be disabled.

© 2010 RuggedCom Inc. All rights reserved

2.3 HIPOT (Dielectric Strength) Testing

Units which are to be "HIPOT" tested in the field must have the braided ground cable disconnected (see Figure 2.3.1) during the HIPOT test. This is required in order to prevent the transient/surge suppression circuitry, which is connected to Surge Ground (see Figure 2.3.1), from being activated during the HIPOT test.

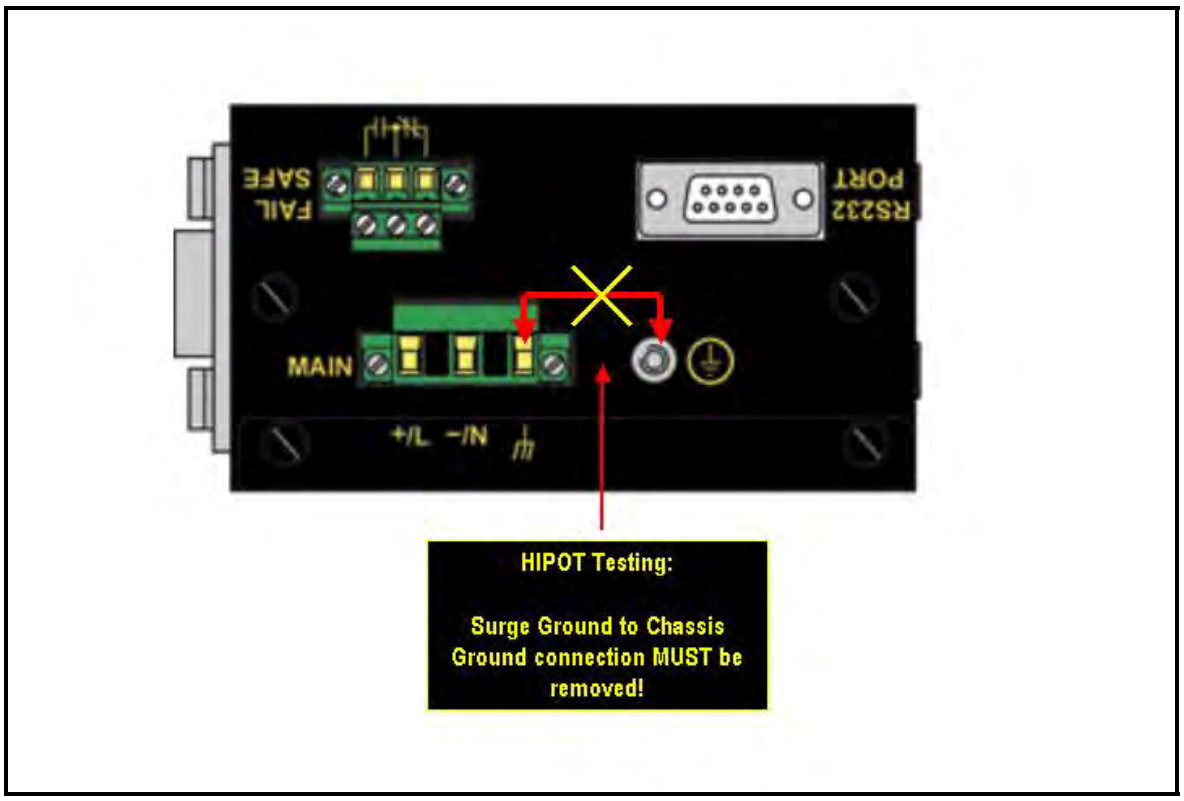


Figure 2.3.1 HIPOT (Dielectric Strength) Testing

© 2010 RuggedCom Inc. All rights reserved

2.4 Failsafe Output Wiring and Specifications

The “Failsafe” output relay is provided to signal critical error conditions that may occur on the RS900G series switch. The contacts are energized upon power up of the unit and remain energized until an alarm condition or power loss occurs.

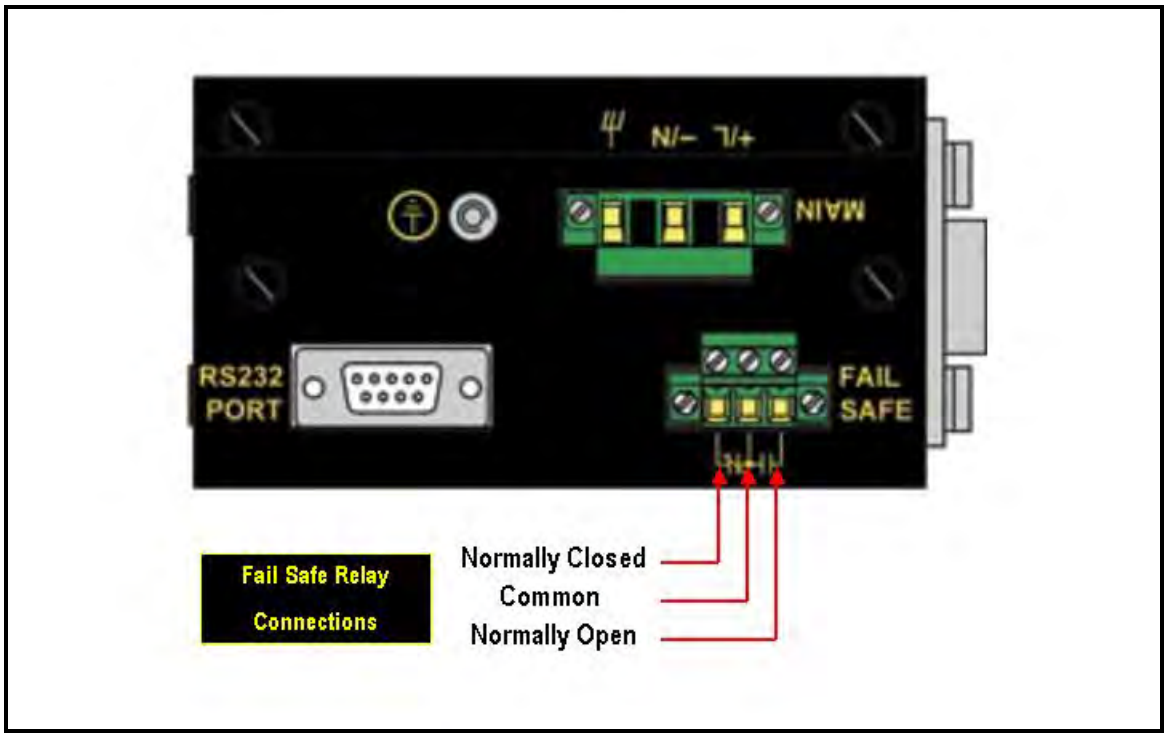


Figure 2.4.1 RS900G Family Failsafe Output Relay

© 2010 RuggedCom Inc. All rights reserved

2.5 RS232 Port Wiring

The RS232 port is used for configuring the unit. A straight-through serial cable with a DB-9 connector is required. There is no need to crossover the Transmit and Receive signals from the PC side since this has been done internally as shown in the figure below.

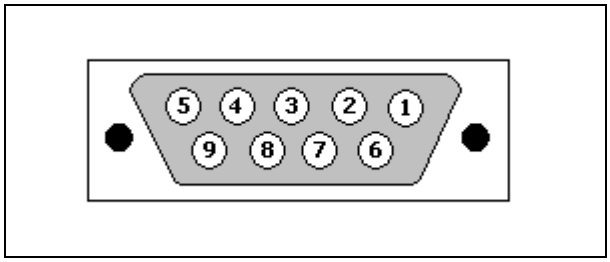


Fig 2.5.1 RS232 Female DCE pin-out

Pin	*Signal*
1	No Connection
2	Transmit Data
3	Receive Data
4	No Connection
5	Ground
6	No Connection
7	No Connection
8	No Connection
9	No Connection

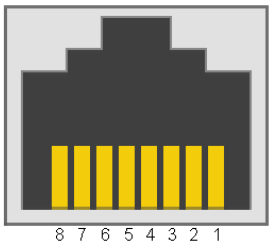
Table 2.5.1 RS232 Female DCE pin-out

NOTE: This port is not intended to be a permanent connection and the cable shall be less than 2m (6.5 ft) in length.

© 2010 RuggedCom Inc. All rights reserved

2.6 RJ45 Ports – Signal Description

The RS900G series switches have several 10/100BaseTX ports that allow connection to standard CAT-5 UTP cable with RJ45 male connectors. The RJ45 receptacles are directly connected to the chassis ground on the unit and can accept shielded CAT-5 cables. If shielded cables are used, care must be taken to ensure the shielded cables do not form a ground loop via the shield wire and the RJ45 receptacles at either end. Fig. 2.6.1 shows the RJ45 port pins configuration.



Pin	Signal
1	+Rx
2	-Rx
3	+Tx
4	No Connection
5	No Connection
6	-Tx
7	No Connection
8	No Connection
Case	Shield (Chassis Ground)

Fig. 2.6.1 shows the RJ45 port pins configuration.

NOTE: RuggedCom does not recommend the use of CAT-5 cabling of any length for critical real-time substation automation applications. However, transient suppression circuitry is present on all copper ports to protect against damage from electrical transients and to ensure IEC 61850-3 and IEEE 1613 Class 1 conformance. This means that during the transient event communications errors or interruptions may occur but recovery is automatic.

RuggedCom also does not recommended to use these ports to interface to field devices across distances which could produce high levels of ground potential rise, (i.e. greater than 2500V) during line to ground fault conditions.

© 2010 RuggedCom Inc. All rights reserved

3 Technical Specifications

3.1 Operating Environment

Parameter	*Range*	*Comments*
Ambient Operating Temperature	-40 to 85°C	Ambient Temperature as measured from a 30cm radius surrounding the center of the RS900G enclosure.
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 85°C	
Operating Altitude	0 to 15240m (0 to 50000 ft)	Over temperature range of -40 to 85°C

3.2 Power Supply Specifications

Power Supply Type	*Minimum Input*	*Maximum Input*	*Fuse Rating*	*Isolation*	*Maximum Power Consumption*
12 – 24 VDC	10 VDC	36 VDC	3.15A (T)	1.5 kV DC	10W
24 VDC	18 VDC	36 VDC	3.15A (T)	1.5 kV DC	
48 VDC	36 VDC	59 VDC / 72VDC	3.15A (T)	1.5 kV DC	
HI (125/250 VDC) [1] HI (110/230 VAC) [1]	88 VDC 85 VAC	300 VDC 265 VAC	3.15A (T)	4 kV AC 5.5 kV DC	

NOTES:
1. This is the same power supply for both AC and DC.
2. (T) denotes time-delay fuse

3.3 Failsafe Relay Specifications

Parameter	*Value*
Max Switching Voltage	30VAC, 80VDC
Rated Switching Current	0.3A @ 30VAC 1A @ 30VDC, 0.3A @ 80VDC

Figure 1 - Failsafe Relay Specification

NOTES:
1. Resistive Load.
2. For Class-2 circuits only.

© 2010 RuggedCom Inc. All rights reserved

3.4 Twisted Pair Data Port Specifications

Data Port	*Media*	*Distance*	*Connector Type*
10/100 Mbps	Cat 5 UTP or STP	100m	RJ45

3.5 Fiber Optical Port Specifications

For maximum flexibility RuggedCom Inc. offers a number of different transceiver choices for Gigabit fiber optical communications. The following table details fiber optic specifications based on the order code / transceiver selected at time of ordering.

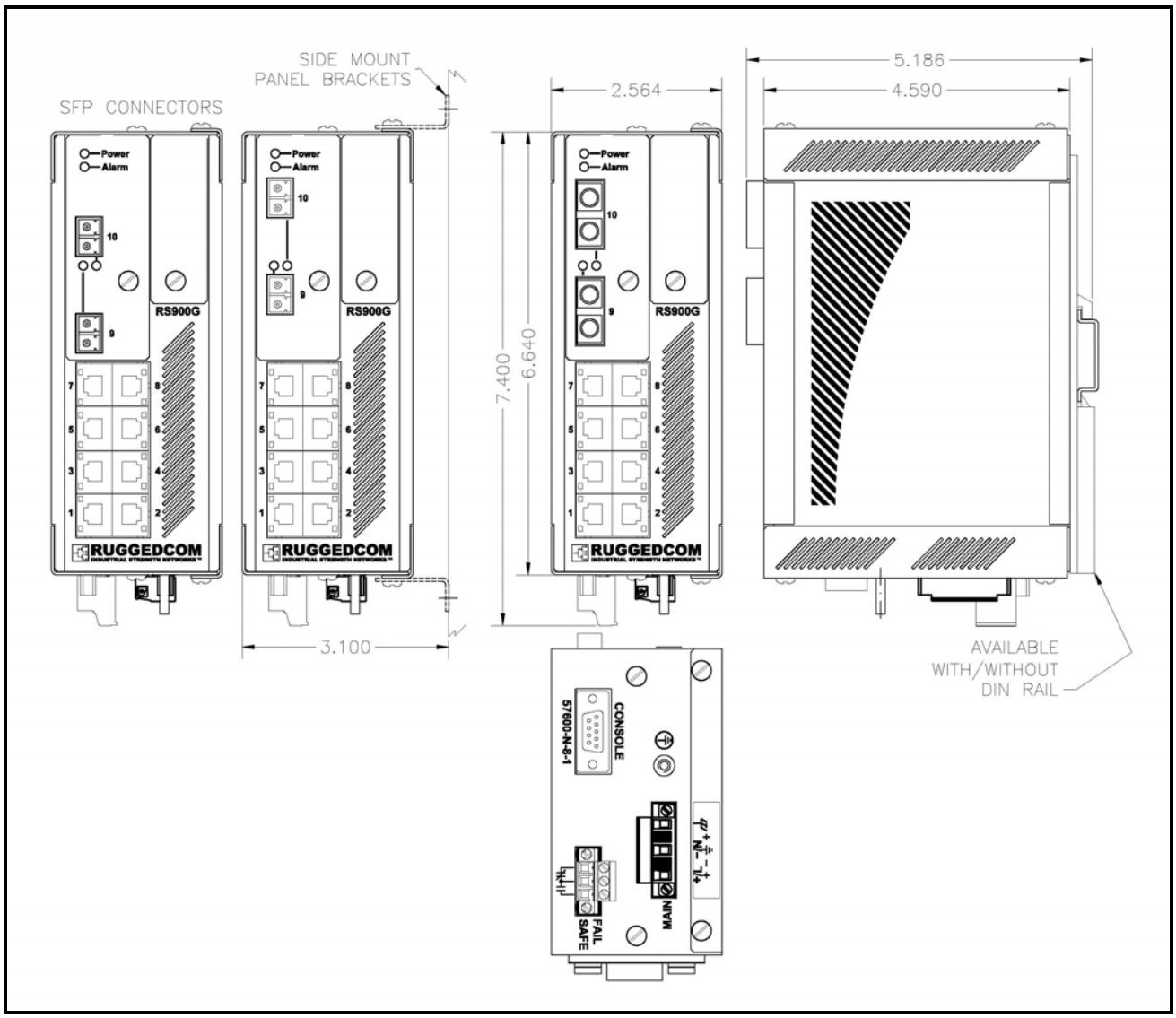
Order Code	Mode / Connector	Tx λ (nm)	Cable Type[2]	Tx Pwr (dBm)[3] (Min/Max)	Rx Sensitivity (dBm)[3]	Rx Saturation (dBm)[3]	Typical Distance[1] (km)
2LCMM	MM / LC	850	50µ/125	-9.5 / -4	-20	0	0.5
2LC10	SM / LC	1310	9µ/125	-9.5 / -3	-22	-3	10
2LC25	SM / LC	1310	9µ/125	-5 / 0	-22	-3	25
2SC10	SM / SC	1310	9µ/125	-10 / -3	-22	-3	10
2SC25	SM / SC	1310	9µ/125	-7 / -3	-24	-3	25
SFP	MM / LC	850	50µ/125	-8.5 / -4	-22	-3	0.5
SFP	SM / LC	1310	9µ/125	-9 / -3	-24	0	10
SFP	SM / LC	1310	9µ/125	-7 / -3	-26	-3	25
SFP[4]	SM / LC	1550	9µ/125	-5 / 0	-26	0	50
SFP[4]	SM / LC	1550	9µ/125	0 / 5	-26	0	80
SFP	SM / SC Simplex	1310	9µ/125	-9 / -3	-22	-3	10
SFP[4]	SM / SC Simplex	1490	9µ/125	-9 / -3	-22	-3	10

NOTES:

1. Maximum segment length is greatly dependent on factors such as fiber quality, and number of patches and splices. Please consult RuggedCom sales associates when determining maximum segment distances.
2. All cabling is duplex type unless otherwise specified.
3. All optical power numbers are listed as dBm averages.
4. These transceivers utilize a distributed feedback (DFB) type laser and are rated for -20°C to +85°C operation only.

© 2010 RuggedCom Inc. All rights reserved

3.6 Physical Dimensions



Parameter	*Value*	*Comments*
Dimensions	7,4 x 2,6 x 5,0 inches (187,96) x (66,04) x (127,0) mm	(Length x Width x Depth)
Weight	2.7 lb (1.2 Kg)	
Enclosure	20 AWG Galvanized Steel	

© 2010 RuggedCom Inc. All rights reserved

4 Type Tests

4.1 IEC 61850-3 Type Tests

Test	*Description*		*Test Levels*	*Severity Levels*
IEC 61000-4-2	ESD	Enclosure Contact	+/- 8kV	4
		Enclosure Air	+/- 15kV	4
IEC 61000-4-3	Radiated RFI	Enclosure ports	20 V/m	x
IEC 61000-4-4	Burst (Fast Transient)	Signal ports	+/- 4kV @ 2.5kHz	x
		D.C. Power ports	+/- 4kV	4
		A.C. Power ports	+/- 4kV	4
		Earth ground ports	+/- 4kV	4
IEC 61000-4-5	Surge	Signal ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
		D.C. Power ports	+/- 2kV line-to-earth, +/- 1kV line-to-line	3
		A.C. Power ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
IEC 61000-4-6	Induced (Conducted) RFI	Signal ports	10V	3
		D.C Power ports	10V	3
		A.C. Power ports	10V	3
		Earth ground ports	10V	3
IEC 61000-4-8	Magnetic Field	Enclosure ports	40 A/m continuous, 1000 A/m for 1 s	N/A
IEC 61000-4-29	Voltage Dips & Interrupts	D.C. Power ports	30% for 0.1s, 60% for 0.1s, 100% for 0.05s	N/A
		A.C. Power ports	30% for 1 period, 60% for 50 periods	N/A
IEC 61000-4-11			100% for 5 periods, 100% for 50 periods [2]	N/A
IEC 61000-4-12	Damped Oscillatory	Signal ports	2.5kV common, 1kV differential mode @ 1MHz	3
		D.C. Power ports	2.5kV common, 1kV differential mode @ 1MHz	3
		A.C. Power ports	2.5kV common, 1kV differential mode @ 1MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal ports	30V Continuous, 300V for 1s	4
		D.C. Power ports	30V Continuous, 300V for 1s	4
IEC 61000-4-17	Ripple on D.C. Power Supply	D.C. Power ports	10%	3
IEC 60255-5	Dielectric Strength	Signal ports	2kV AC (Fail-Safe Relay output)	N/A
		D.C. Power ports	1.5kV DC	N/A
		A.C. Power ports	2kV AC	N/A
IEC 60255-5	H.V. Impulse	Signal ports	5kV (Fail-Safe Relay output)	N/A
		D.C. Power ports	5kV	N/A
		A.C. Power ports	5kV	N/A

© 2010 RuggedCom Inc. All rights reserved

4.2 IEEE 1613 Type Tests

IEEE Test	IEEE 1613 Clause	Description		Test Levels
C37.90.3	9	ESD	Enclosure Contact	+/- 8kV
			Enclosure Air	+/- 15kV
C37.90.2	8	Radiated RFI	Enclosure ports	35 V/m
C37.90.1	7	Fast Transient	Signal ports	+/- 4kV @ 2.5kHz
			D.C. Power ports	+/- 4kV
			A.C. Power ports	+/- 4kV
			Earth ground ports	+/- 4kV
C37.90.1	7	Oscillatory	Signal ports	2.5kV common mode @ 1MHz
			D.C. Power ports	2.5kV common & differential mode @ 1MHz
			A.C. Power ports	2.5kV common & differential mode @ 1MHz
C37.90	6	H.V. Impulse	Signal ports	5 kV (Failsafe Relay)
			D.C. Power ports	5 kV
			A.C. Power ports	5 kV
C37.90	6	Dielectric Strength	Signal ports	2kV AC(Failsafe Relay)
			D.C. Power ports	1.5kV DC
			A.C. Power ports	2kV AC

NOTE:

- If the unit contains copper ports the IEEE 1613 conformance is Class 1 (During disturbance errors may occur but recovery is automatic).
- If the unit contains all fiber ports the IEEE 1613 conformance is Class 2 (During disturbance no errors will occur).

4.3 IEC Environmental Type Tests

Test	Description		Test Levels	Severity Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40 deg. C, 16 Hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85 deg. C, 16 Hours	N/A
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (non-condensing), 55°C, 6 cycles	N/A
IEC 60255-21-1	Vibration		2g @ (10-150) Hz	Class 2
IEC 60255-21-2	Shock		30g @ 11 ms	Class 2

© 2010 RuggedCom Inc. All rights reserved

4.4 Agency Approvals

Agency	*Standards*	*Comments*
CSA	CSA C22.2 No. 60950, UL 60950	Approved
CE	EN 60950, EN 61000-6-2	CE Compliance is claimed via Declaration of Self Conformity Route
FCC	FCC Part 15, Class A	Approved
CISPR	EN55022, Class A	Approved
FDA/CDRH	21 CFR Chapter 1, Subchapter J	Approved
IEC/EN	EN60825-1:1994 + A11:1996 + A2:2001	Approved
CSA	Hazardous Locations Class 1, Division 2, Groups A, B, C,& D. T6 rating at 40°C, T4A rating at 85°C	Approved

5 Warranty

RuggedCom warrants this product for a period of five (5) years from date of purchase. For warranty details, visit http://www.ruggedcom.com or contact your customer service representative. Should this product require warranty or service, contact the factory at:

RuggedCom Inc.
300 Applewood Crescent
Concord, Ontario
Canada L4K 5C7
Phone: +1 905 856 5288
Fax: +1 905 856 1995

© 2010 RuggedCom Inc. All rights reserved